State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

STANDING STOCKS OF FISHES IN SECTIONS
OF INDIAN CREEK, PLUMAS COUNTY, 1977

by

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Information Report
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INTRODUCTION

In 1976, the Department of Water Resources (DWR) initiated an instream flow program. The purpose of this program is to identify streams that would benefit from flow enhancement, assess instream values and identify trade-offs required to enhance these streams. The Northern District of DWR selected Indian Creek below Antelope Reservoir (Figure 1) as one of the streams it would study under this program. Initial flow studies by DWR indicated that trout habitat could be doubled in the first 10 miles of Indian Creek and increased 25 percent in lower reaches by flow augmentation. As a result of this study, DWR and the Department of Fish and Game decided to reoperate Antelope Reservoir to increase flow releases to 20 cfs year-round on a trial basis. These flows would be such that operation of Antelope Reservoir would not be impaired.

The role of the Contract Services Section in this study is to monitor fish populations in selected sections of Indian Creek and assist DWR personnel in determining fishing effort and catch in the creek. This report describes sections of the creek we sampled, describes fish species we caught, and fish biomass at each station.

METHODS

Standing stocks of fishes were estimated at six stations in Indian Creek (Figure 1 and Table 1). Each station contained riffles and pools. Stations were selected to be near stations that had been sampled in previous studies. Each station we selected was not necessarily representative of the river reach in which it was located. Stations varied in length from 32 to 73 m. The length, average width, and average depth of each station
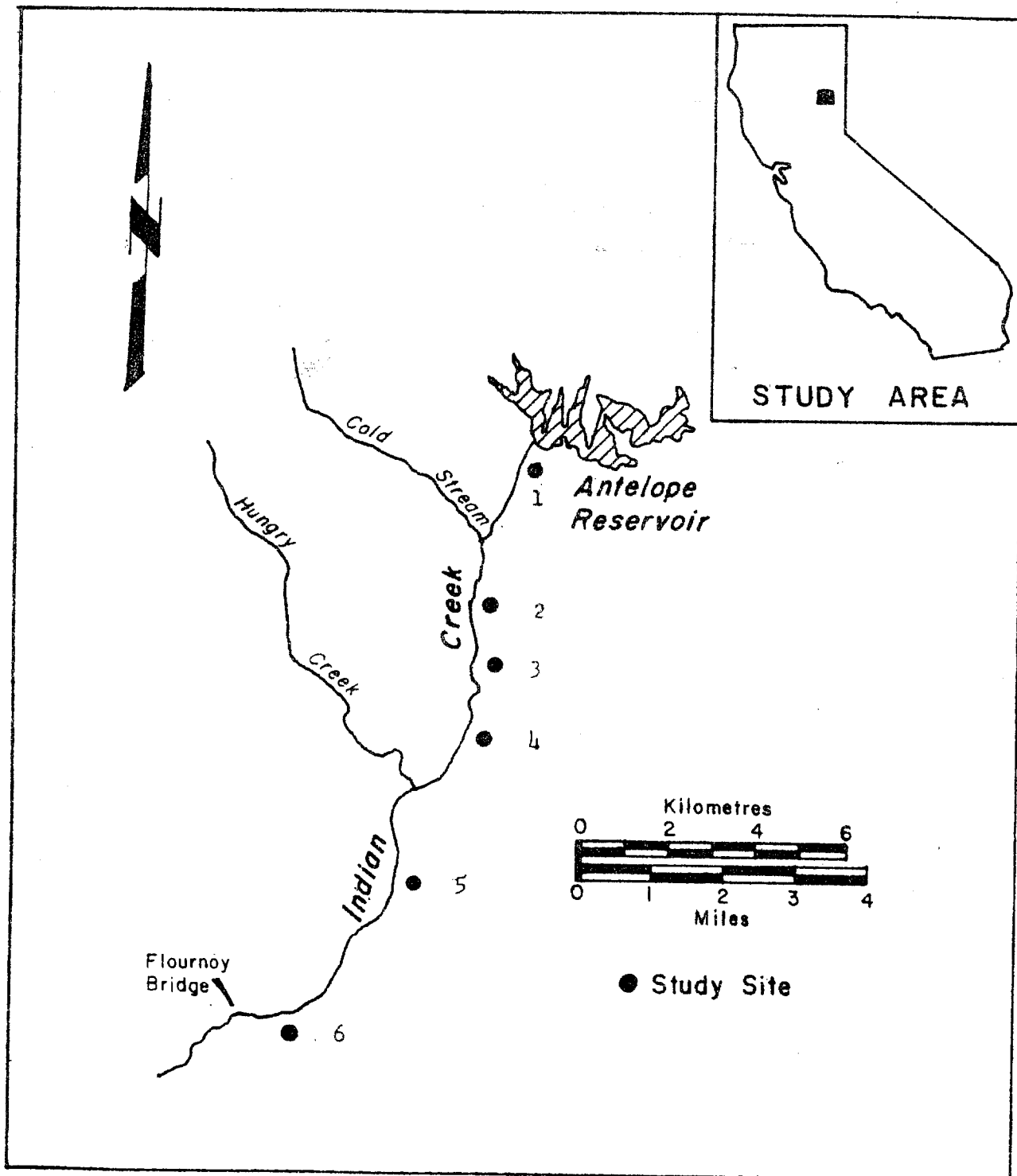
Figure 1. – Stations which were sampled to determine biomass of fishes in Indian Creek, Plumas County, October 1977.

TABLE 1

Descriptions of Study Sites

Station 1 is 0.6 km below Antelope Dam and it is adjacent to a picnic
area near the junction of a spur road leading to the base of the dam and
Indian Creek Road (NE¼ of NE¼, Section 27, T27N, R12E). The station extends
64 m upstream from a clump of six pine trees on the right bank (RB) 32 m
upstream from the cattle guard on Indian Creek Road to a 12-cm-diameter pine
on the left bank (LB). Each end of the station is marked by 36-mm metal
disks on small pines. The station consists of two small pools separated by
riffle area and has a surface area of 212 m^2 and a volume of 29 m^3.

Station 2 is 13.9 km above Flournoy Bridge, 1.9 km below Cold Stream,
and 3.9 km below Antelope Dam (SW¼ of SW¼, Section 34, T27N, R12E). The
station extends from a 36-cm-diameter alder (RB) downstream to a 10-cm-
diameter pine (RB). Both are marked with metal disks which can be seen
from the road. The station contains areas of rapids and shallow pools. It
has a surface area of 133 m^2, a volume of 17 m^3, and it is 13.7 m long.

Station 3 is 11.8 km above Flournoy Bridge, 3.7 km above Hungry Creek,
and 5.3 km below Antelope Dam (NW¼ of NW¼, Section 10, T26N, R12E). The
lower end of the station is 27 m upstream from the upper end of a parking
turnout. The station extends 40.8 m upstream from a 38-cm-diameter alder
(RB) to a 279-cm-diameter pine (RB). Both are marked with metal disks
which can be seen from the creek. The section contains a riffle area which
enters a 0.9-m-deep pool created by a small beaver dam followed by a shallow
pool and a rapid. It has a surface area of 199 m^2 and a volume of 46 m^3.

Station 4 is 11 km above Flournoy Bridge and 6.8 km below Antelope Dam
(NW¼ of SW¼, Section 10, T26N, R12E). The upper end of the station is down-
stream from a drainage ditch at the lower end of the parking turnout located
0.3 km above a secondary road crossing the creek. The station extends 31.7 m
downstream to the end of a riffle just above a long shallow pool. It con-
tains riffle and shallow pool areas with a small amount of undercut bank
(RB). It is not marked with metal disks. The station has a surface area of
136 m^2 and a volume of 10 m^3.

Station 5 is at an unimproved campground 5.5 km upstream from Flournoy
Bridge and 12.3 km below Antelope Dam (SW¼ of SW¼, Section 21, T26N, R12E).
The station extends from the lower end of a riffle area with several grassy
hummocks 73 m upstream. Metal disks on a small willow at the lower end
(LB) and a large alder snag at the upper end (RB) mark the station. The
station contains a riffle and shallow run area, a shallow pool with under-
cut bank (RB), and a riffle area. It has a surface area of 580 m^2 and a
volume of 65 m^3.

Station 6 is 1 km upstream from Flournoy Bridge adjacent to a spur road to a lumber mill off Indian Creek Road and 21 km below Antelope Dam. The way down to Indian Creek has been cleared and there is an abandoned water pump just before the spur road enters the yard of a private residence. The station is 183 m downstream past a long pool created by a beaver dam. The lower end of the section is at the upper end of a steep rapid. The station extends 39 m upstream and is marked with metal disks on 10-cm-diameter alders (RB). The upper half of the station is a shallow pool, followed by a rocky run and a small pool in the lower half. The station has a surface area of 170 m^2 and a volume of 26 m^3.

was measured with a cloth tape. Fish were captured with a battery-powered backpack electroshocker in stream sections blocked by seines. Fish were removed from the net-enclosed section on each pass. Standing stock estimates were developed using the two-count method of Seber and LeCren (1967) or the multiple-pass method of Leslie and Davis (1939) with limits of confidence computed using a formula proposed by DeLury (1951).

The weight of each fish, except brown bullhead (Ictalurus nebulosus), was determined by displacement. Fork length of each fish, except brown bullhead, was measured to the nearest millimeter.

Markers were placed in trees along the stream to permanently establish station boundaries for future sampling.

RESULTS

Distribution

We caught brown trout (Salmo trutta), rainbow trout (Salmo gairdneri), brown bullhead, speckled dace (Rhinichthys osculus), golden shiner (Notemigonus crysoleucas), Sacramento sucker (Catostomus occidentalis), and Sacramento squawfish (Ptychocheilus grandis) in Indian Creek. Brown trout were caught at every station. We observed rainbow trout throughout the creek, although we did not catch them at each station. We caught brown bullheads, speckled dace, and golden shiners near Antelope Reservoir, but not at downstream sections. We caught Sacramento squawfish and Sacramento suckers only at the lowest section of the sampling area.

Standing Crop

Brown trout were the most common game fish caught. Biomass of brown trout averaged 5.8 g/m^2 at the six stations (Table 1), while rainbow trout averaged 1.2 g/m^2 in three stations (Table 2). Brown trout large enough to

TABLE 1

ESTIMATES OF BROWN TROUT STANDING CROP
IN INDIAN CREEK, PLUMAS COUNT, 1977

Distance Below Antelope Dam (km)	Population Estimate	95 Percent Confidence Interval	Biomass g/m^2	Estimate of Catchable Trout (127 mm F.L.)	Biomass of Catchable Trout g/m^2
0.6	4	4-4	4.2	4	4.2
3.9	22	19-24	8.1	17	7.4
5.3	71	61-81	17.5	48	16.7
6.8	17	10-24	0.7	0	0
12.3	81	66-97	1.0	4	0.3
21.0	5	5-5	3.3	4	3.3

TABLE 2

ESTIMATES OF RAINBOW TROUT STANDING CROP
IN INDIAN CREEK, PLUMAS COUNTY, 1977

Distance Below Antelope Dam (km)	Population Estimate	95 Percent Confidence Interval	Biomass g/m^2	Estimate of Catchable Trout (127 mm F.L.)	Biomass of Catchable Trout g/m^2
5.3 [1]	1	1-1	0.5	1	0.5
12.3	5	2-7	0.3	2	0.2
21.0	4	0-11	2.7	4	2.7

TABLE 3

ESTIMATES OF STANDING CROPS OF NONGAME FISHES
IN INDIAN CREEK, PLUMAS COUNTY, 1977

Distance Below Antelope Dam (km)	Species	Population Estimate	95 Percent Confidence Interval	Biomass g/m^2
0.6 [2]	Brown bullhead	216	87-345	82.2
0.6	Speckled dace	16	13-19	1.0
0.6	Golden shiner	35	32-38	0.6
21.0	Sacramento squawfish	3 [3]	-	-
21.0	Sacramento sucker	23	16-29	3.9

[1] Rainbow trout were not caught at other stations.
[2] These species were not caught in other stations.
[3] Actual catch; no estimate was made.

catch (127 mm FL) averaged 5.3 g/m^2 (450 fish/ha) and rainbow trout large enough to catch averaged 1.1 g/m^2 (49 fish/ha).

Brown bullhead was the most common nonsalmonid we caught. We calculated a biomass of 82.2 g/m^2 for one station. Speckled dace biomass was 1.0 g/m^2 and golden shiner biomass was 0.6 g/m^2 in the same station. Sacramento sucker biomass was 3.9 g/m^2 in our lowest station. We also caught Sacramento squawfish in this station, but we could make no estimate of their biomass (Table 3).

Age and Growth

The formula L = 24.0 + 0.545 S describes the relationship between the fork length (L) and enlarged scale radius (S) of 59 brown trout. The coefficient of correlation (r) is 0.83. No formula was developed for rainbow trout because we could not read many of their scales. Some scales had regnerated and some were damaged by parasites.

The back-calculated body lengths of 58 age-group-1 brown trout at the end of the first winter of their lives averaged 104 mm. The correction for intercept was 24.0. We had too few usable scales to project an average length at the end of the second winter for the 10 age-group 2 brown trout we caught, or for the rainbow trout.

Age-class-0 brown trout ranged from 61 to 108 mm F.L., age-class-1 were 142 to 231 mm F.L., and age-class-2 were 241 to 315 mm F.L. Age-group-0 represented 59 percent of the catch, age-group-1 represented 39 percent, and age-group-2 represented 2 percent (Figure 2).

The relationship between the length (L) and weight (W) of brown trout is $\log_{10}W = -4.566 + 2.818 \log_{10}L$, r = 0.994, and n = 186 (Figure 3).
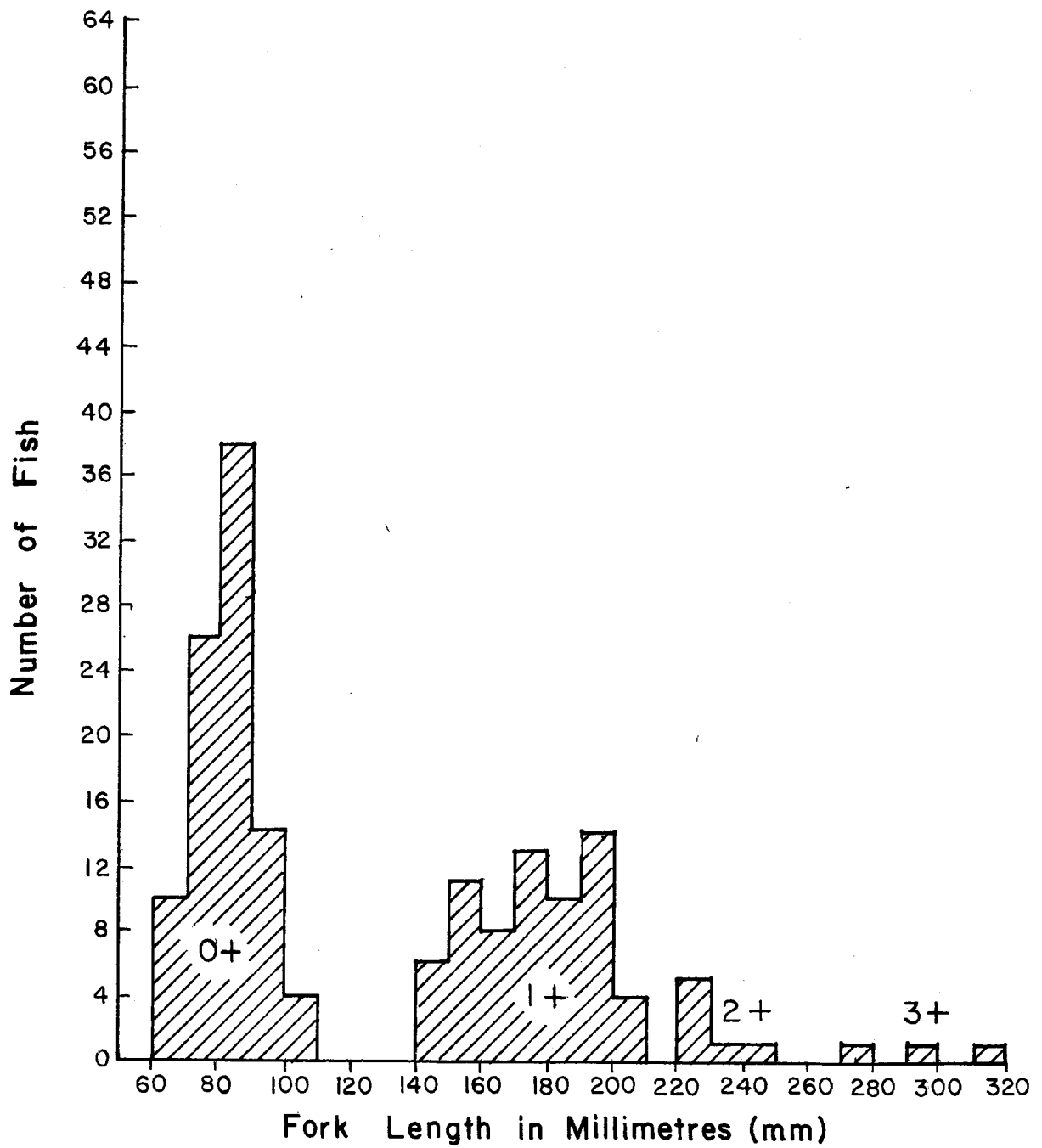
Figure 2. - Length, frequency of occurence, and age of brown
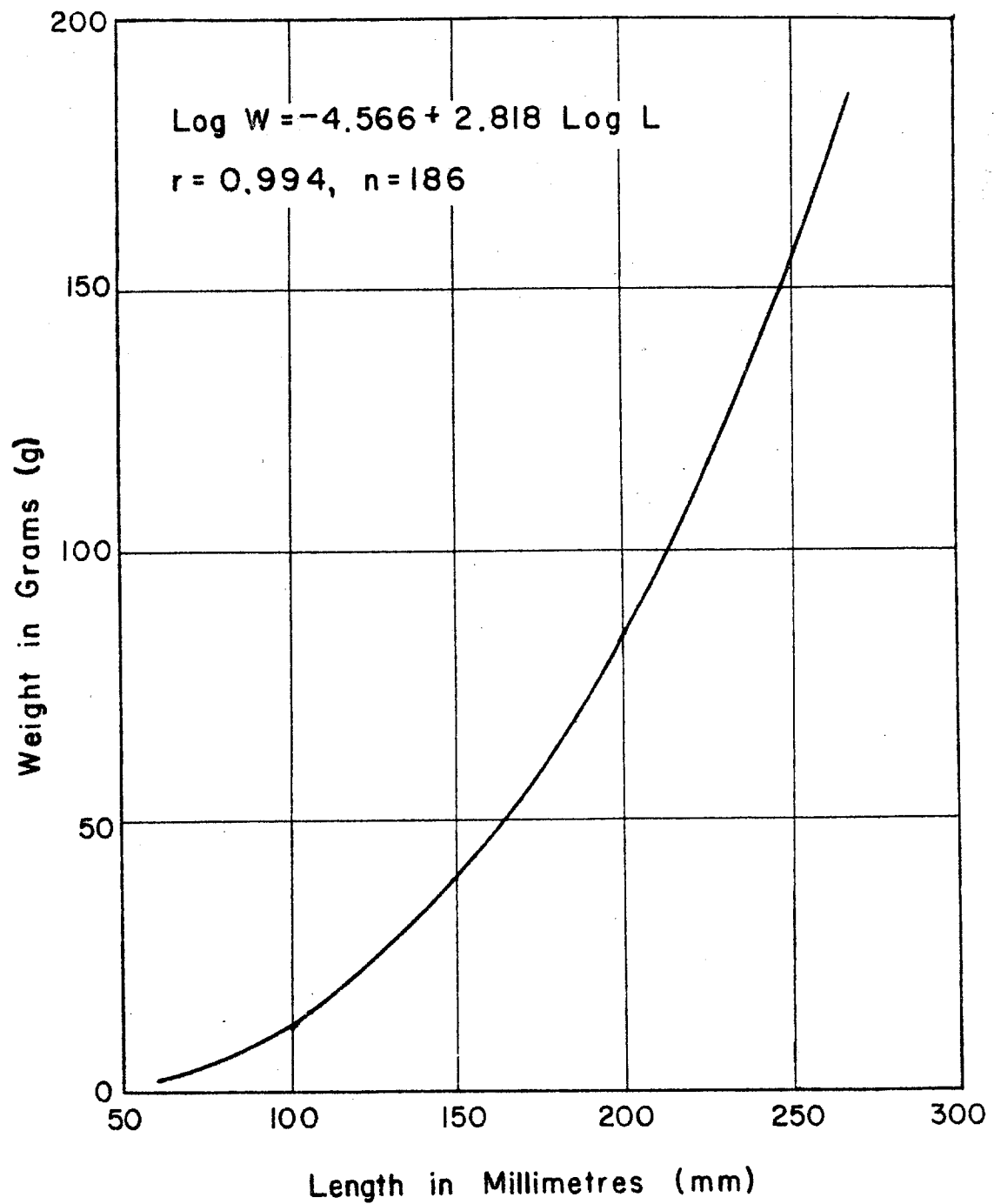trout (<u>Salmo trutta</u>) caught in sections of Indian
Creek, Plumas Country, 1977.

Figure 3. – The relationship between length and weight of
brown trout (<u>Salmo trutta</u>) caught in sections
of Indian Creek, Plumas County, 1977.

Coefficient of Condition

The mean value for the coefficient of condition (K) and 95 percent confidence limits were $1.232 \pm$ for 109 age-group-0 brown trout, 1.061 ± 0.197 for 67 age-group-1 trout, and 1.065 ± 0.537 for 10 age-group-2 trout. Although the mean K value for age-group-0 fish was 14 percent higher than the mean K for age-group-1 and age-group-2 fish, this difference was not statistically significant ("t" test, 0.05 level, 184 d.f.). Therefore, the overall mean K value and 95 percent confidence limits was 1.201 ± 0.339.

We could not differentiate between male and female brown trout, so we could not test the hypothesis that K was different for either sex. We noted that some fish were nearly ready to spawn and some were not. The mean value for K and 95 percent confidence limits were 1.240 ± 0.507 for 8 rainbow trout of mixed ages. The difference between the mean value of K for rainbow trout and brown trout was not statistically significant ("t" test, 0.05 level, 190 d.f.). We had too few rainbow trout to test the hypothesis that age-group-0 and age-group-1 and 2 were in the same condition.

ACKNOWLEDGEMENTS

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APPENDIX 1

Length and Weight of Brown Trout
Caught in Indian Creek in October, 1977.

APPENDIX 1

LENGTH AND WEIGHT OF BROWN TROUT
CAUGHT IN INDIAN CREEK IN OCTOBER, 1977

Length -mm-	Weight -g-	Length -mm-	Weight -g-
61	4	94	9
62	3	95	11-9-9
65	4	96	10-10-10
66	4-4-3	98	10-12
68	4	101	11
69	5	102	13
70	4-4-5	105	13
71	5-4	108	17
72	3-4-5-5	142	30
73	5-5-4-5-5	144	31
74	5	147	33-40
75	6-5-5	149	39
76	5-5-5	150	36
77	6-5-5-5-5	151	31
78	8-6-6-6	153	41
79	7-6-6	155	38
80	4-6-8-6-7-5-7- 7-7-6-7-6	157	36
		158	40-47-37-49
81	8-7-7-7-5-6	159	39
82	7-8-8	160	44-42
83	7-7-8-7-6-7-7	161	40
84	6-6-7-5-7	162	44-43
85	9-8-8-8-9-7-7-7	165	53-46
86	9-8	166	49
87	8-8-7	167	50
88	10-7-11	169	46
89	8	171	55-49
90	9	172	50-46-51
92	9-10-9	173	51-57
93	9		

Length -mm-	Weight -g-	Length -mm-	Weight -g-
174	64-53	196	71-85-78-80-80
175	54	198	85
177	50-54	200	70-96
179	63	206	92
181	77-61	207	106
182	75-63	208	92-117
183	63-71	225	135
185	64	227	127
187	70	229	177-128
189	80	230	140
190	72	231	136
191	77	241	155
192	75	272	207
193	70-77-84	293	127
194	77-72	315	295
196	71-85-78-80-80		

APPENDIX 2

LENGTH AND WEIGHT OF RAINBOW TROUT
CAUGHT IN INDIAN CREEK IN OCTOBER, 1977.

APPENDIX 2

LENGTH AND WEIGHT OF RAINBOW TROUT
CAUGHT IN INDIAN CREEK IN OCTOBER, 1977.

Length −mm−	Weight −g−		Length −mm−	Weight −g−
56	3	3	144	37
62		3	181	82
128		22	206	91
142		30	212	114